RACOR®

# *Fuel Filter / Water Separator Pump Systems*


Parker

# SMART PUMPS FOR PRECISE FUEL MANAGEMENT

## INSTANT FUEL FLOW AT "KEY-ON" – AUTOMATIC PRIMING, NO MORE HARD STARTS

Whether the fuel filter/water separator is frame or engine-mounted, Racor brushless filter pumps offer the industry's most advanced and robust electronic fuel management systems. Important system benefits include the possibility of variable flow fuel delivery and monitoring of the entire fuel system… even when the engine is not running. No more fuel leak-back issues, no more hard starts. This is the next generation of fuel management and conditioning, for the next generation of diesel engines.

## ADVANCED DSP CONTROLLER TECHNOLOGY

The Racor sensorless Digital Signal Processor (DSP) controller allows for precise fuel flow management and diagnostics tailored to customer specifications using flexible software routines. Precision control of fuel flow, current draw, motor rpm, and system pressure is possible using the internal DSP and/or with input from the Electronic Control Unit (ECU). DSP technology provides peripheral capabilities such as fault isolation and reporting of critical system parameters – in short, total fuel management for optimum engine performance.

- Fixed speed operation – flow does not vary with load
- Variable speed operation – controlled by input signal from ECU
- Built-in test and diagnostics with output signal capability
- Automotive rated electronics inside the fuel pump
- Low current sleep mode eliminates need for a relay
- Flexible software to tailor control algorithms to customer needs

## GEROTOR PUMP

Racor's advanced gerotor pump uses the same proven technology used in lubrication pumps in the aircraft industry. It offers the benefits of fewer parts, smaller size, and lighter weight than other pumps of the same capacity.

- Fewer parts than gear or vane-style pumps
- Smaller size and lighter weight than pumps with the same capacity
- Greater contamination resistance
- Proven aerospace design
- 2 lpm to 4 lpm possible at 60 psi

## BRUSHLESS DC MOTOR

Most electric DC motors use carbon "brushes" to conduct the electrical current to the "commutator" that serves to sequentially polarize the motor windings and induce rotation. Racor's brushless DC motor windings are sequentially polarized to rotate the pump shaft by high speed electronic switching, controlled by a DSP, not by brushes rubbing and making sparks on a metallic commutator. No brushes means nothing to wear out, and no possibility of brush debris in the fuel. Brushless motors are more efficient than brushed motors and have unsurpassed reliability and long life. The brushless motor's shaft directly drives the gerotor gear, creating a unique, positive displacement pump assembly.

- Design proven up to 26V DC, 10A continuous power
- Resistant to vibration and can be engine mounted
- 8-pole, 9-slot configuration
- Rotor: cylindrical magnet and rotor
- Rotor rotates outside stator

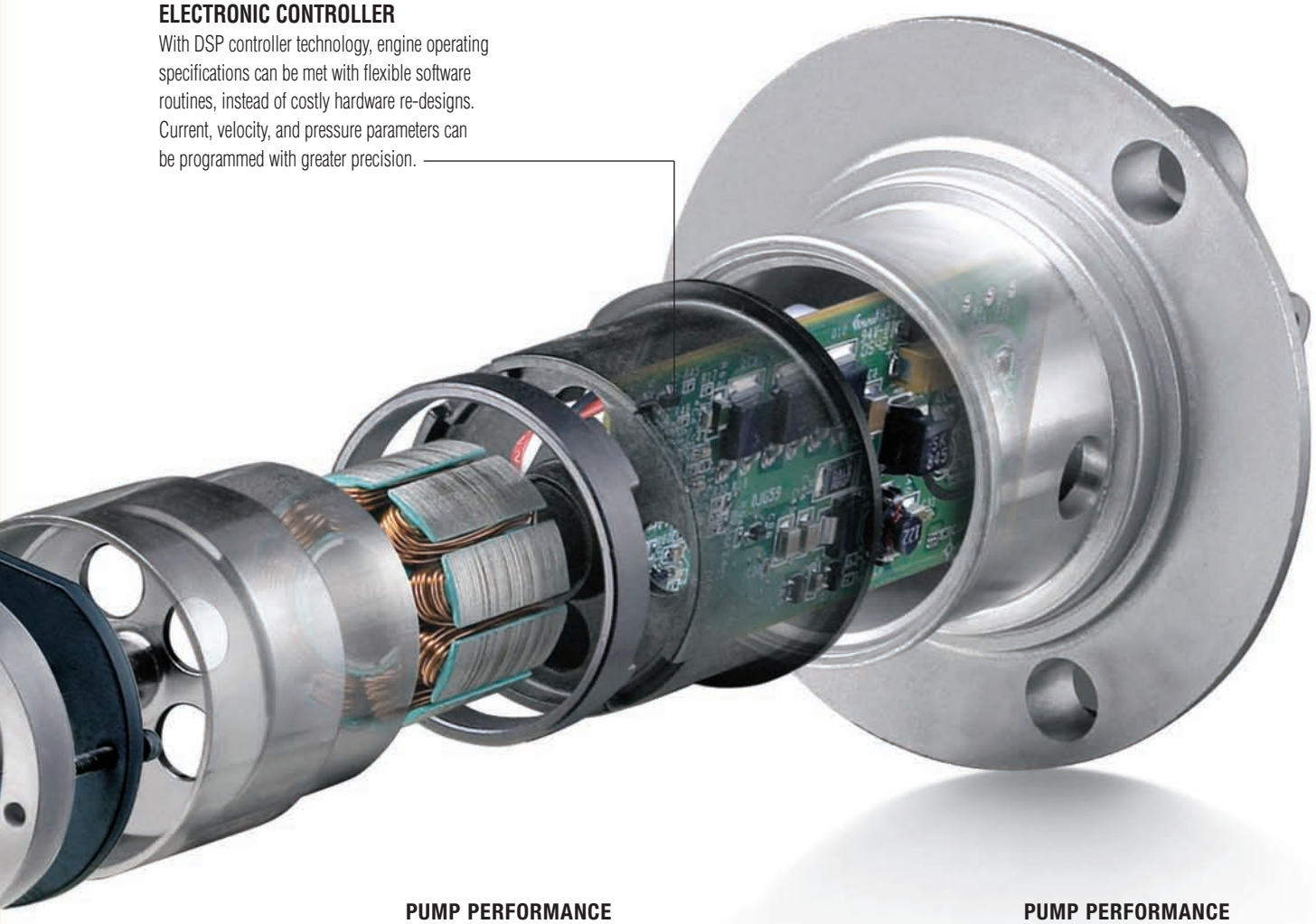
## SIX-PIN ELECTRICAL CONNECTOR

- Variable speed command input for variable flow rates
- Motor current feedback for fuel system diagnostics
- Status output for fuel pump diagnostics
- Low current sleep mode for direct battery connection
- Power
- Ground
- 12 and 24 volt design with variable fuel flow even at low engine speed

Racor fuel pumps are available in both brushless and traditional brush technology. This brushed pump shown consists of a pre-screen filter, a flow bypass circuit and a roller cell pump powered by a DC motor.

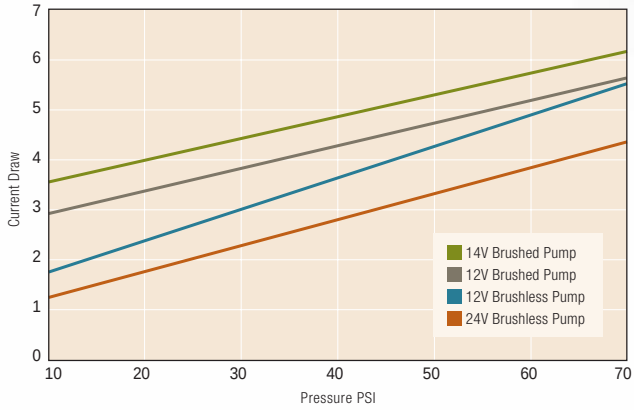
## ELECTRONIC CONTROLLER

With DSP controller technology, engine operating specifications can be met with flexible software routines, instead of costly hardware re-designs. Current, velocity, and pressure parameters can be programmed with greater precision.



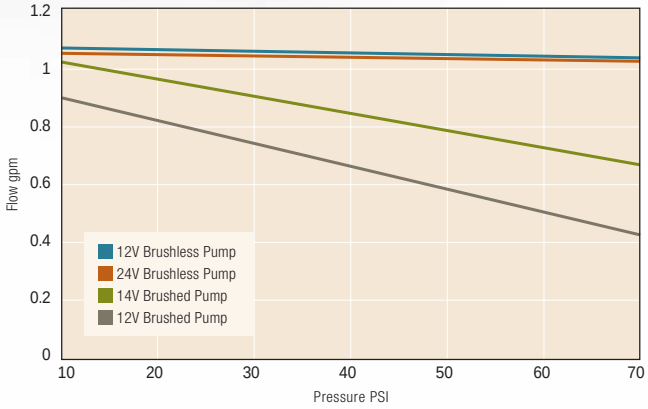
## PUMP PERFORMANCE

Current Draw Versus Pressure




## PUMP PERFORMANCE

Flow Versus Pressure



# INTEGRATED FILTER/SEPARATOR PUMP SYSTEMS FOR TODAY'S DIESEL ENGINES

For the most advanced filtration in the world, Racor engineers have brought aerospace technology to the modern diesel engine. Brushless smart pumps deliver consistent fuel flow with the engine on or off. The fuel system conditions are analyzed, communicated and then adjusted through engine ECU commands.

Racor Filter/Separator Pump Systems are a complete fuel conditioning module with primary and secondary filters, fuel heaters, sensors and regulators. Systems are engineered to meet any application, any operating environment and any mounting location. They can be delivered complete with hose, fittings and connectors to facilitate installation and reduce costs.

## AEROSPACE TECHNOLOGY MEETS THE DIESEL ENGINE IN A POWERFUL PARTNERSHIP.

- Racor engineering has delivered breakthrough fuel filtration systems that help diesel engines meet stringent EPA emission standards. The intelligent pump inside the fuel filter module is an essential element, matching engine performance to mandated clean air requirements. Better fuel management translates into reduced emissions.
- Electronic sensors monitor, and then communicate, engine system conditions to the brushless pump. The pump responds quickly and precisely, controlling both fuel pressure and flow. Coupled with options and high efficiency filters, clean, dry fuel is delivered to the engine fuel injection system.

| Filter Pump Specifications | |
|---|---|
| Maximum Flow Rate | 72 gph / 273 lph |
| Clean Pressure Drop | <1 psi / 6.9 kPa |
| System Filtration Efficiency | 98% @ 4 microns |
| Water Removal | 100% per SAE tests |
| Materials Biodiesel Compatibility | B2 to B20 Biodiesel<br>Ultra-low sulphure diesel (ULSD) fuel |
| Maximum Pump Output Pressure @ 7 amps | 50 psi / 345 kPa |
| Pressure Regulation | Variable to 50 psi / 345 kPa |
| Pressure Transducer | For closed-loop flow control |
| Pump Electrical Connector | Deutsch DT06-65 |
| Fittings Ports | M16 Standard (or as specified) |

### System Highlights

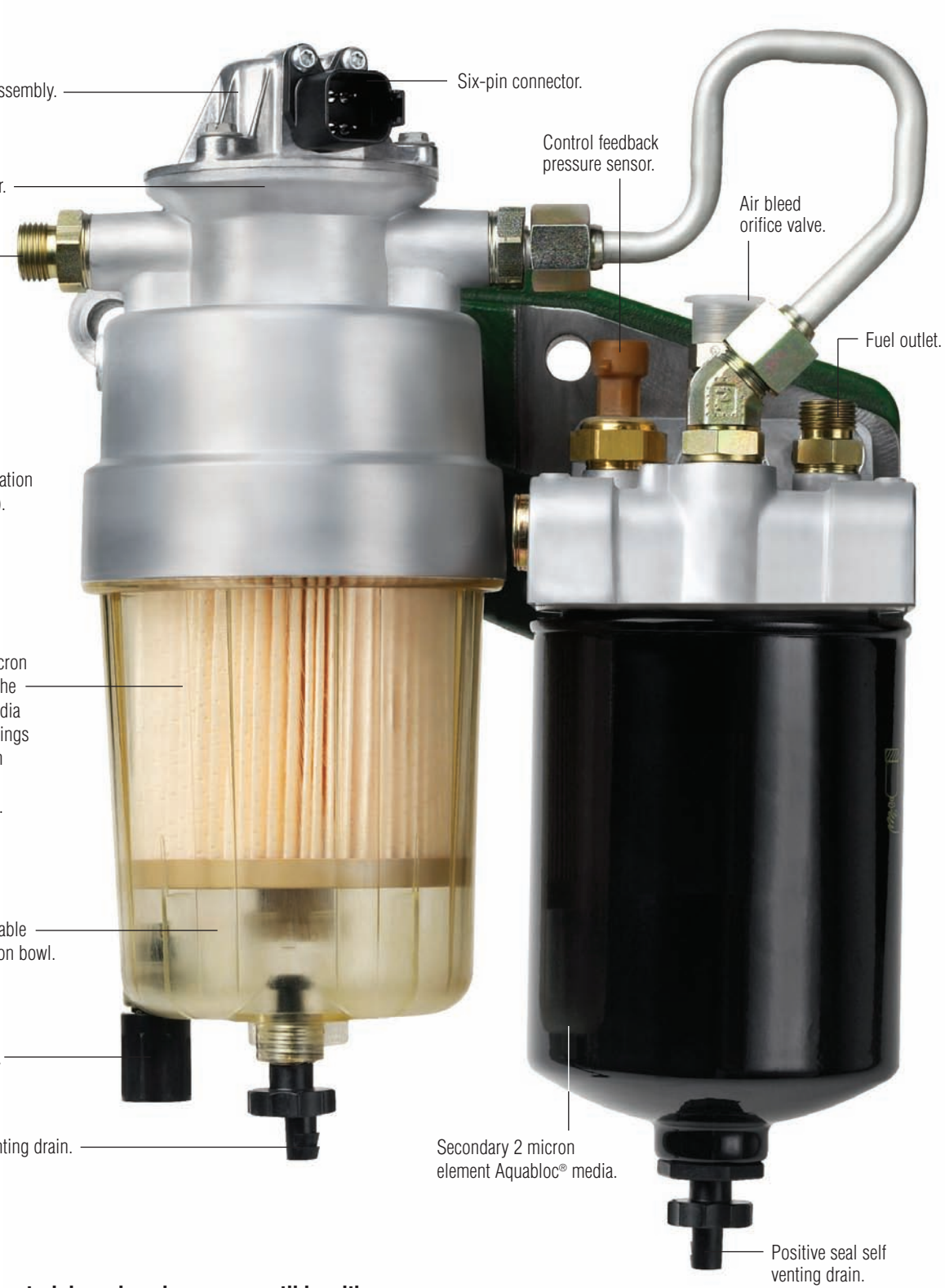
- Mechanical fuel pumps are engine driven, and so fuel pressure and flow vary with engine speed. During a hard start, a mechanical pump will take time to develop pressure.

  The intelligent choice is an electric pump, which can operate at full flow at "key-on." The fuel system is pressurized before the engine starter begins cranking. Efficient, consistent fuel flow results in reduced emissions and maintenance costs.

- The Racor brushless pump utilizes advanced electronics to energize the magnetic motor coils and vary the phase. Digital Signal Processor (DSP) electronics and the gerotor pump are designed to maintain constant pump speed – therefore speed does not vary with load.

  Racor electronics are "intelligent" and designed to analyze the fuel system and respond to the engine's electronic control unit (ECU) commands, providing consistent and responsive fuel delivery even at reduced engine speeds.

# RACOR SMART PUMP TECHNOLOGY CAN BE ENGINEERED INTO A WIDE RANGE OF FUEL CONDITIONING SYSTEMS




**All Racor filter materials and seals are compatible with ultra-low sulphur diesel (ULSD) fuel and B2 to B20 Biodiesel.**

See Racor bulletin 7679.

# P SERIES FUEL CONDITIONING MODULES

Durable, quiet 12V DC roller-cell electric fuel pump offers the benefit of an electric, on-demand, priming pump, for intermittent or continuous duty.

Thermostatically controlled PTC-style electric (150-watt) heater facilitates cold weather starting.


Return fuel in.

Fuel outlet.

Rugged, lightweight aluminum housing.

High-performance Aquabloc II cartridge-style filter media is environmentally friendly and incinerable.

Water-in-fuel (WIF) sensor alerts the operator when service is required. Under-dash control module for pump and water sensor operation is included with pump option.

Positive seal self venting drain.

Removable and reusable contaminant collection bowl.

**All Racor filter materials and seals are compatible with ultra-low sulphur diesel (ULSD) fuel and B2 to B20 Biodiesel.**

See Racor bulletin 7679.

Standard: 12V DC brushed pump motor.
Optional: 12V or 24V DC brushless pump motor.

**Important Note: American Boat and Yacht Council standards allow for installation outside of the vessel's engine room only.**

The patented P Series diesel fuel conditioning module was developed for installation on any diesel engine fuel injection system. P Series assemblies are available in three sizes and all feature 3/8" NPT fuel ports. This innovative and modular fuel filter/water separator incorporates low-pressure fuel system components into a single package. The P Series Diesel Fuel Conditioning Module is available with a brushless pump. Please contact Racor Division for information on specific applications.

**For vacuum applications only.**

| Basic Models | P3 | P4 | P5 |
|---|---|---|---|
| Maximum Flow Rate | 30 gph / 114 lph | 40 gph / 170 lph | 50 gph / 227 lph |
| Clean Pressure Drop | 0.4 psi / 2.8 kPa | 0.5 psi / 3.4 kPa | 0.8 psi / 5.5 kPa |
| Maximum Pump Output at 14 volts / 70 psi (480 kPa) / 6.2 amps | 40 gph / 151 lph | 40 gph / 151 lph | 40 gph / 151 lph |
| Pump Output Pressure | 10 to 70 psi (60 kPa to 480 kPa) | 10 to 70 psi (60 kPa to 480 kPa) | 10 to 70 psi (60 kPa to 480 kPa) |
| Standard Fuel Port Size (SAE J476) | 3/8" – 18 npt | 3/8" – 18 npt | 3/8" – 18 npt |
| Biodiesel Compatible | B2 to B20 | B2 to B20 | B2 to B20 |
| Total Number of Ports Available: | 2 | 2 | 2 |
| Fuel Inlets | 1 | 1 | 1 |
| Fuel Outlets | 1 | 1 | 1 |
| Replacement Elements: | | | |
| 2 micron | R58060-2 | R58095-2 | R58039-2 |
| 10 micron | R58060-10 | R58095-10 | R58039-10 |
| 30 micron | R58060-30 | R58095-30 | R58039-30 |
| Minimum Service Clearance | 2.5" (28 mm) | 2.5" (28 mm) | 2.5" (28 mm) |
| Height | 7.7" (196mm) | 9.0" (229 mm) | 11.5" (292 mm) |
| Depth | 5.2" (132 mm) | 5.2" (132 mm) | 5.2" (132 mm) |
| Width | 4.8" (122 mm) | 4.8" (122 mm) | 4.8" (122 mm) |
| Weight (dry) | 3.4 lb (1.5 kg) | 3.8 lb (1.7 kg) | 4.2 lb (1.9 kg) |
| Features:[1] | | | |
| Water Sensor | Standard | Standard | Standard |
| Heater | Standard | Standard | Standard |
| Pressure Regulator (10 psi) | Standard | Standard | Standard |
| Operating Temperature | -40˚ to +255˚F / -40˚ to +121˚C | | |

[1] Not for use with gasoline applications.

**How To Order –** The example below illustrates how part numbers are constructed.

| P4 | 2 | 10 | N | H |
|---|---|---|---|---|
| Specify 'P3' for 30 gph, 'P4' for 40 gph, or 'P5' for 50 gph | '2' must be in the part number. (It specifies a 12V DC pump) | Specify micron rating of element: '02', '10', or '30' | 'N' must be in the part number. (It specifies standard 3/8" npt ports) | 'H' must be in the part number. (It specifies a 12V DC, 150-watt heater) |

For information on continuous running pumps, please contact Racor Division at racorengus@parker.com.

# TURBINE SERIES ELECTRIC PRIMER PUMP KIT

## Turbine Series Electric Primer Pump

The Turbine Series Electric Primer Pump Kits can be retrofitted to many of the Racor 900 or 1000 series fuel filters already in service. The Filter Pump is an innovative and proprietary system consisting of a pre-screen filter, a flow bypass circuit and a roller cell pump powered by a DC motor. When the switch is activated the fuel is drawn into the pre-screen and then pumped through the housing, refilling the unit with fuel. When not in use the Filter Pump system is bypassed and the Racor fuel filter/water separator functions normally.

The RKP1912, 12V DC Kit, contains a traditional brushed motor design. The RKP1924, 24V DC Kit, contains innovative brushless motor technology.

The use of this primer pump kit allows the operator to easily re-prime the Racor Filter/Separator directly from the fuel storage tank with no mess.


**The complete Primer Pump Kit makes installation quick and easy.**

**100 micron pre-screen.**

**A rugged roller-cell pump. 60 gph flow rate while in priming mode.**

**12V DC or 24V DC Motor.**

**Unitized assembly only 3.3" tall.**

Water-in-fuel sensor and indicator.

**All Racor filter materials and seals are compatible with ultra-low sulphur diesel (ULSD) fuel and B2 to B20 Biodiesel.**
See Racor bulletin 7679.

UL-listed drain valve and water sensor probe options are available.

MA units have shielded see-thru bowls; MAM bowls are all-metal.

Note: Not for use as continuous duty.

Wiring harness and controller switch supplied as part of complete kit.

# SPIN-ON SERIES WITH ELECTRIC PRIMING

## 700 Series Integrated Filter/Separators

The Racor 700 Series is equipped with state-of-the-art fuel pumps with either brush or brushless DC motors. In brushless versions, the motor shaft directly drives the gerotor, creating a unique, positive displacement pump. The gerotor has fewer parts than gear or vane pumps, and the sensorless control technology of the brushless DC motor make this product the most reliable filter and pump assembly on the market. The brushless pump assembly is ideal for tough on-engine applications. For off-engine mounting, brushed pumps are a more economical alternative.

The 700 Series Integrated Fuel Filter/Water Separators have a two-stage filtration and repriming system. This complete fuel management system isolates contaminants present in diesel fuels and traps them prior to reaching the fuel injection system, protecting against costly and premature failure.


Positive seal self venting drain.

Bowls are virtually indestructible. They won't discolor from exposure to alcohol, additives or UV light.

Water sensor and vacuum gauges to signal service are valuable options available for most models.

**A rugged roller-cell pump. 60 gallons per hour flow rate while in priming mode.**

**Unitized assembly only 3.3" tall.**

**100 micron pre-screen.**

**12V DC or 24V DC Motor.**

**All Racor filter materials and seals are compatible with ultra-low sulphur diesel (ULSD) fuel and B2 to B20 Biodiesel.**

See Racor bulletin 7679.

Aquabloc II media is corrugated, allowing greater surface area exposure for fuel filtration and an increased dirt-holding capacity.

| MODEL | 790MAM | 790R |
|---|---|---|
| Maximum Flow Rate | 90 gph / 341 lph | 90 gph / 341 lph |
| Gasoline or Diesel | Diesel | Diesel |
| Vacuum Installation | Yes | Yes |
| Maximum PSI [1] | 30 psi / 207 kPa | 30 psi / 207 kPa |
| Clean Pressure Drop | 0.25 psi / 1.7 kPa | 0.95 psi / 6.5 kPa |
| Port Size | 7/8" NPT | 3/8" NPT / 16 mm |
| Integral Primer Pump | Yes | Yes |
| Element | S3201TUL | R90 |
| No. of Ports | 4 | 4 |
| Drain Type | Positive Seal | Self Vent |
| Water Sensor Option | Yes | Yes |
| Height | 12.8" / 325 mm | 11.8" / 300 mm |
| Width | 4.3" / 110 mm | 4.5" / 114 mm |
| Depth | 6.5" / 165 mm | 4.8" / 121 mm |
| Weight | 6.5 lbs / 3.0 kg | 2.9 lbs / 1.4 kg |

**Additional models in the 700 Spin-on Series are the 745R (45 gph) and the 760R (60 gph).**

# SPIN-ON SERIES WITH MANUAL PRIMING

Powerful manual primer pumps are integrated into the mounting heads.

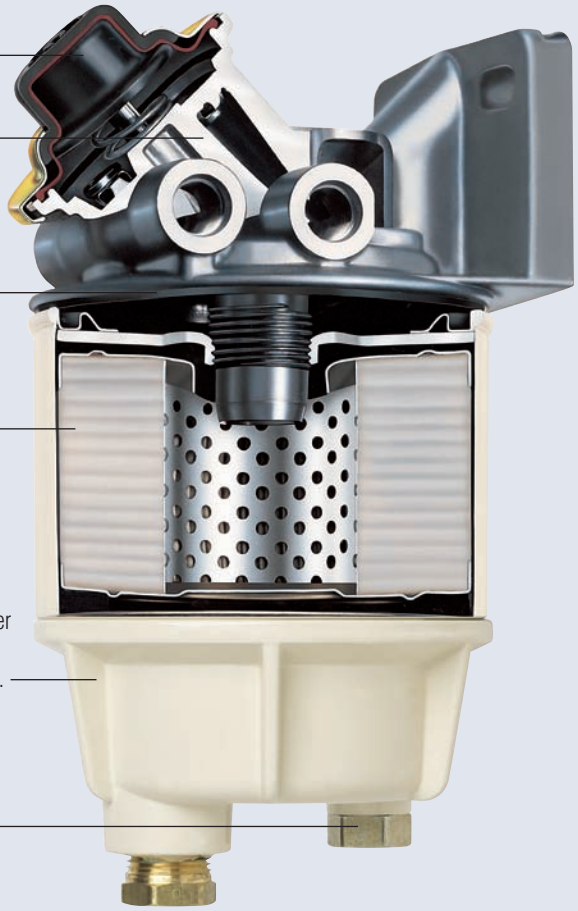
Die cast aluminum heads with multiple ports make installation as easy as adding options.

The best gaskets and o-rings available for consistent, sure seals.

Aquabloc II media is corrugated, allowing greater surface area exposure for fuel filtration and an increased dirt-holding capacity.

Bowls are virtually indestructible. They won't discolor from exposure to alcohol, additives or UV light. A die cast aluminum bowl with epoxy powder paint and drain plug meet CFR33 regulation and other marine standards.

Water sensor and vacuum gauges to signal service are valuable options available for most models.



For information about additional Racor Spin-on Series models with manual priming, request brochure 7529 Fuel Filtration Systems or brochure 7501 Marine Fuel Filtration Systems.

| MODEL | 245RMAM | 490MAM | 460R | 4120R |
|---|---|---|---|---|
| Maximum Flow Rate | 45 gph / 170 lph | 90 gph / 341 lph | 60 gph / 227 lph | 120 gph / 454 lph |
| Gasoline or Diesel | Diesel | Diesel | Diesel | Diesel |
| Vacuum Installation | Yes | Yes | Yes | Yes |
| Pressure Installation | Yes | Yes | Yes | Yes |
| Maximum PSI [1] | 30 psi / 207 kPa | 30 psi / 207 kPa | 30 psi / 207 kPa | 15 psi / 103 kPa |
| Clean Pressure Drop | 0.61 psi / 4.21 kPa | 0.95 psi / 6.5 kPa | 0.39 psi / 2.7 kPa | .85 psi / 5.9 kPa |
| Port Size | 1/4" NPT | 3/8" NPT | 3/8" NPT | 3/4" SAE |
| Integral Primer Pump | Yes | Yes | Yes | Yes |
| Element | R25TUL | S3201TUL | R60 | R120 |
| No. of Ports | 3 | 4 | 4 | 4 |
| Drain Type | Positive Seal | Positive Seal | Self-Vent | Self-Vent |
| Water Sensor Option | Yes | Yes | Yes | Yes |
| Height | 10.5" / 267 mm | 12.8" / 325 mm | 11" / 279 mm | 15" / 381 mm |
| Width | 4" / 102 mm | 4.5" / 114 mm | 4.5" / 114 mm | 4.5" / 114 mm |
| Depth | 4" / 102 mm | 4.8" / 121 mm | 4.8" / 121 mm | 4.8" / 121 mm |
| Weight | 2.2 lbs / 1.0 kg | 2.9 lbs / 1.4 kg | 2.7 lbs / 1.3 kg | 3.9 lbs / 1.8 kg |

(1) Pressure installations are applicable up to the maximum PSI shown.

# GET THE INSIDE STORY

Racor Fuel Filter/Water Separator Pump Systems are available in a wide range of configurations, operating and maintenance choices. The product line includes systems with conventional brushed pumps and the new Racor brushless pump that was engineered using Parker Aerospace technology.

The smart brushless pump systems control fuel delivery via a programmable chip. Fuel system conditions are analyzed and communicated to the Electronic Control Unit (ECU) which responds to the information. The enclosed CD provides an overview of the Racor Fuel Filter/Water Separator Pump Systems. For additional information, please contact Parker Racor Division.

ALSO AVAILABLE FROM RACOR.

# ECO III® HEAVY-DUTY AIR FILTRATION SYSTEMS

The new Racor ECO III air filtration systems bring the technology of heavy-duty air cleaners to an unprecedented level. To deliver maximum filter life, the ECO III housing inlet is positioned to direct air flow evenly around the filter – engaging the entire element in the contaminant removal process. A secondary filter, or safety filter, can be specified for severe service environments. Multiple sealing surfaces have been designed into the housing to ensure system integrity.

The durable, corrosion-free housing comes installation-ready for direct attachment of a Racor closed crankcase filter system to meet the requirements of emission reduction legislation. The base mounting bracket and included hardware installs quickly, in any direction, to the engine, frame rail or fire wall. This unique design eliminates the need for costly custom-made brackets. Service is quick with no tools required. Compact, efficient, flexible, reliable – engineered for the long-haul. Racor ECO III reinvents air filtration, inside and out.

To simplify element changeouts, two molded handles, and an extended edge lip let hands firmly grasp and remove the integral end pan filter element… with no contact or contamination to the skin.

A key feature of the ECO III housing is the tangential orientation of the 7" inlet, which directs air flow evenly around the element. Element life is increased because the entire filter is engaged in the process.

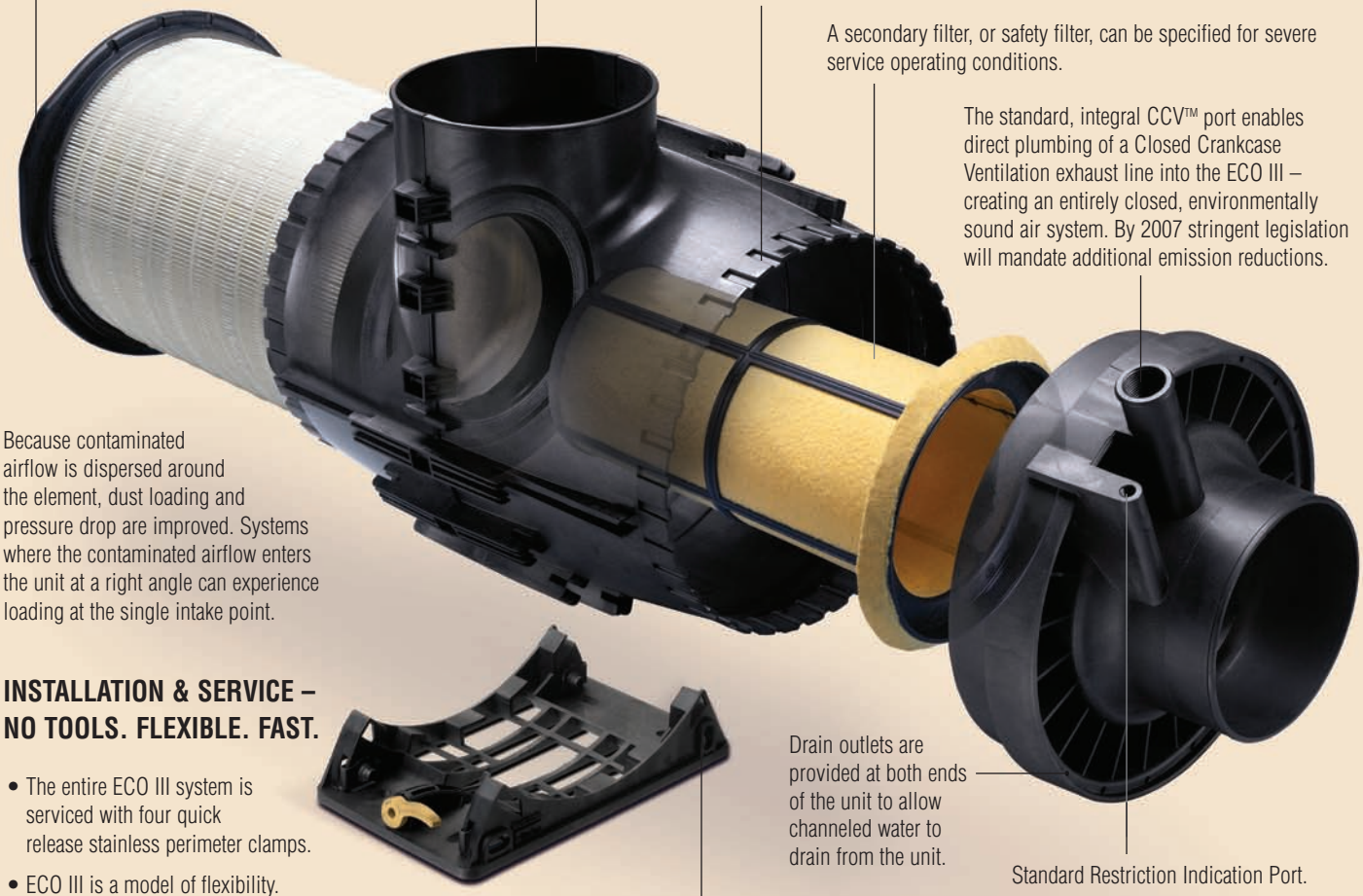
The solid injection molded glass-filled nylon polymer housing is corrosion-free, a durable construction that increases the temperature operation range to 250°F. The rugged assembly provides heavy duty structural strength proven to dependably withstand severe vibration.

Simple, clean, toolless service was a design imperative, and a major ECO III benefit. Simple snap clamps secure the housing and integrated filter element components.

At both ends of the housing, keyed channels lock the element outlet component securely into place – to prevent element misalignment and rotation.

A secondary filter, or safety filter, can be specified for severe service operating conditions.

The standard, integral CCV™ port enables direct plumbing of a Closed Crankcase Ventilation exhaust line into the ECO III – creating an entirely closed, environmentally sound air system. By 2007 stringent legislation will mandate additional emission reductions.



Because contaminated airflow is dispersed around the element, dust loading and pressure drop are improved. Systems where the contaminated airflow enters the unit at a right angle can experience loading at the single intake point.

Drain outlets are provided at both ends of the unit to allow channeled water to drain from the unit.

Standard Restriction Indication Port.

## INSTALLATION & SERVICE – NO TOOLS. FLEXIBLE. FAST.

- The entire ECO III system is serviced with four quick release stainless perimeter clamps.
- ECO III is a model of flexibility.

  The housing can be rotated 180˚ on the base. The outlet port is field reversible, and the orientation of the inlet port is adjustable in 20˚ increments.
- The reversible base mounting bracket and included hardware mounts quickly, in any direction, to frame rail or firewall. This complete mounting system eliminates the need for custom made, field engineered and installed brackets – a significant savings of time and money.
- "Quick Key", integral to the mounting base, securely locks the ECO III housing after the filtration unit has been precisely positioned.

For ease of installation, both the CCV and Restriction Indicator Ports can be rotated 360° in 10˚ increments.

The ECO III features an enlarged 6" radiused outlet to further reduce overall system restriction. This leak-free outlet port can be positioned on either end of the ECO III housing to simplify installation.

**For additional information, request brochure #7655.**



ECO III is Patent Pending

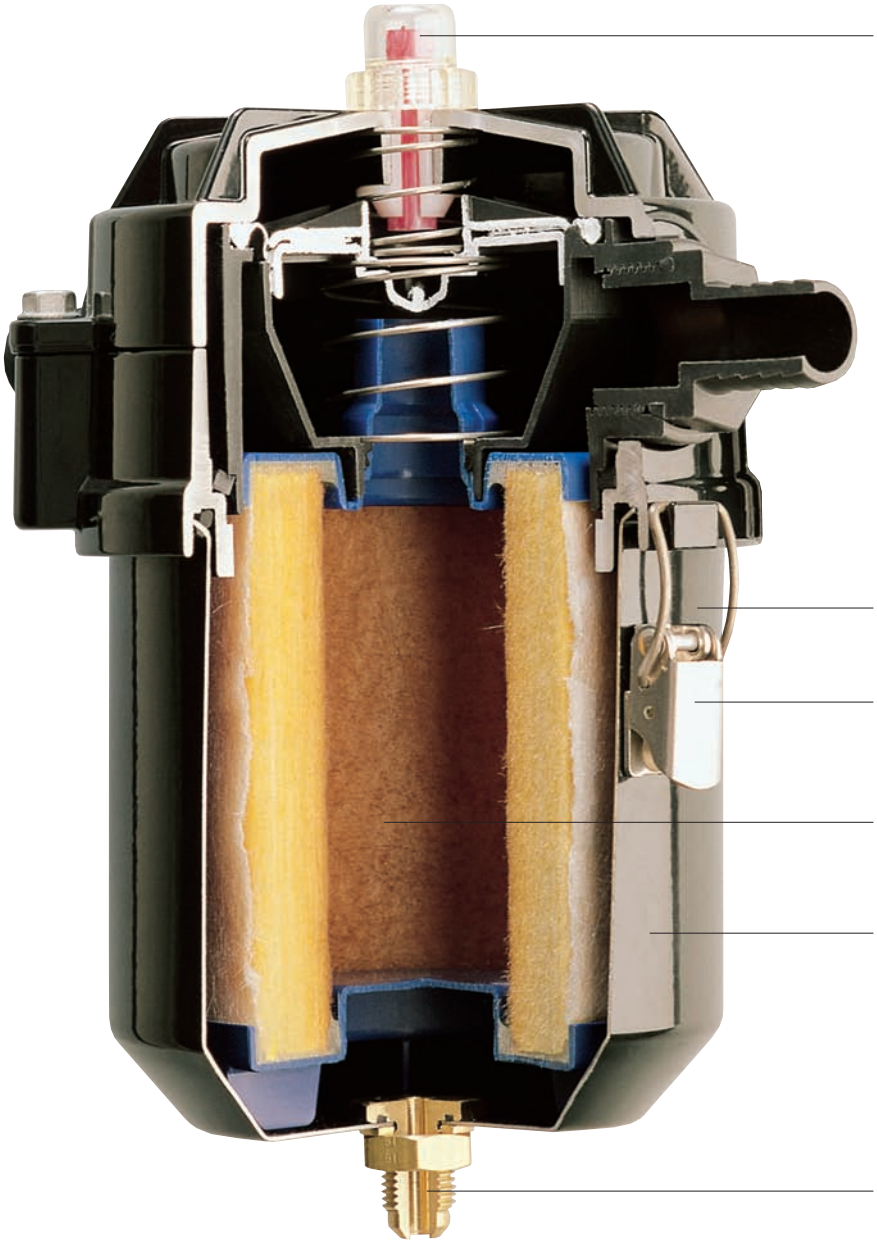
# CLOSED CRANKCASE FILTRATION SYSTEMS

## Racor CCV™ Systems

In a robust, compact package, the patented Racor CCV Closed Crankcase Ventilation Filtration Systems provide superior oil coalescence and crankcase pressure control under the most severe conditions.

Racor CCV Systems eliminate crankcase emissions and provide a cleaner engine environment by performing the following functions:

- They reduce oil consumption by separating the oil from crankcase gases and returning the oil to the sump.
- The high-efficiency filter prevents fouling of the turbocharger and after-cooler.
- Filtered crankcase gas is returned to the engine intake system for re-combustion instead of polluting the environment.
- Keeps engine compartment and components clean.



Pop-up style indicator that alerts of a bypass condition and the need for a filter change.

A unique crankcase pressure regulator with integral bypass valve minimizes variation in crankcase pressure. Excessive variation in crankcase pressure can damage seals, cause loss of oil and other problems.

Left- or right-hand inlet/outlet options.

High-efficiency oil separation to 0.3µ (microns).

Durable glass-filled nylon and die cast aluminum components.

Steel with epoxy powder coating.

Stainless steel latches for tool-less element change.

Replaceable high-performance filter with depth-loading, micro-glass fiber coalescing media.

Extended filter service interval from the Vaporbloc element.

Maximum continuous operating temperature, -40°F to +240°F (-40˚C to 116˚C).

Drain check valve allows collected oil to be returned to the crankcase. This eliminates frequent draining and significantly reduces oil consumption.

**For additional information, request brochure #7539.**

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